

REMARKS

Claims 1-46 are pending in the application. In the Office Action at hand, Claims 24-46 are withdrawn, Claims 10-23 are allowed, Claims 1-3 and 6-9 are rejected, and Claims 4 and 5 are objected to. The Applicants thank the Examiner for the allowance of Claims 10-23.

Claims 1 and 2 are rejected under 35 U.S.C. Section 102(e) as being anticipated by WO 02/26378. In addition, Claims 1-3, and 9 are rejected under 35 U.S.C. §102(b) as being anticipated by Etievant. The Applicant points out that Paragraph 3 of the Office Action incorrectly states that Claims 19-21 are rejected under Etievant, since Claims 10-23 are indicated as allowable in Paragraphs 5 and 6. Furthermore, Claims 6-8 are rejected under 35 U.S.C. §103(a) as being unpatentable over either WO 02/26378 or Etievant. In response to the Section 102(e), 102(b) and 103(a) rejections, the Applicants respectfully submit that Claims 1-3 and 6-9, as amended, are not anticipated or obvious in view of WO 02/26378 and Etievant. Reconsideration is respectfully requested.

Claim 1, as amended, recites a gas separation apparatus including an irradiation chamber for receiving a gas. An irradiation device is included for irradiating the gas within the irradiation chamber for causing molecules of the gas to break apart into larger and smaller constituent components. A separation arrangement is included for applying a force for separating the larger and smaller constituent components from each other within the irradiation chamber by forcing the larger and smaller constituent components toward different regions of the irradiation chamber due to differential motion characteristics of the larger and smaller constituent components. A first outlet is included for removing the smaller constituent components from the irradiation chamber.

Claim 1 has been amended to recite "a separation arrangement for applying a force for separating the larger and smaller constituent components from each other within the irradiation chamber by forcing the larger and smaller constituent components toward different regions of the irradiation chamber due to differential motion characteristics of the larger and smaller constituent components." Support for this amendment is found at least in FIGs. 1-8, as well as on page 5, lines 7-15, page 6, line 3 through page 7, line 21, and page 9, line 1, through page 18, line 5, of the Specification as originally filed.

In embodiments of the claimed invention, the irradiation device can be configured to sufficiently irradiate gas in the irradiation chamber, such as hydrocarbon gas to cause the gas to break apart into larger constituent components such as including carbon, and smaller constituent components, such as hydrogen and/or hydrogen ions. For example, an electron beam device as claimed in Claim 3 can break apart the gas in the irradiation chamber in an effective and compact manner. In addition, by having a separation arrangement for applying forces within the irradiation chamber on the larger and smaller constituent components, the larger and smaller constituent components can be moved and forced toward different regions of the irradiation chamber due to differential motion characteristics that can exist between larger and smaller constituent components having different masses and/or electrical charges. Therefore, separation of the constituent components can continuously occur within the irradiation chamber while at the same being irradiated. This can allow separation in a quick, efficient and compact manner. Motion and separation can be caused for example, by centrifugal forces with a rotary member, or electrical or magnetic forces with a wave form generator, applied within the irradiation chamber, or combinations thereof.

In contrast, WO 02/26378 discloses in FIGs. 1 and 2, the treatment of CH_4 or H_2S with a corona discharge within a reactor 14. The treatment of the CH_4 forms hydrogen (H_2) 18 and C_2H_2 , and the treatment of H_2S forms hydrogen (H_2) 18 and sulfur (S) 13, which can be separated from each other by allowing the hydrogen (H_2) 18 to be filtered and passively separated through a membrane 16 and removed through outlets exiting the reactor 14. It would appear that a mixture of hydrogen (H_2) 18 and C_2H_2 or sulfur (S) 13 extends throughout the reactor 14, and membrane 16 merely allows only the H_2 to exit the reactor 14 through the hydrogen outlets, but not the C_2H_2 or S. As a result, there are no forces applied to the H_2 and C_2H_2 or S within the reactor 14 which move and separate the H_2 and C_2H_2 or S from each other to different regions of the reactor 14 due to differential motion characteristics of the components. Instead, the separation of the H_2 occurs passively while exiting the reactor 14 and the membrane is not a separation arrangement as recited in the claimed invention.

Accordingly, Claims 1 and 2, as amended, are not anticipated by WO 02/26378 since the reference does not teach or suggest “a separation arrangement for applying a force for separating the larger and smaller constituent components from each other within the irradiation chamber by

forcing the larger and smaller constituent components toward different regions of the irradiation chamber due to differential motion characteristics of the larger and smaller constituent components,” as recited in Claim 1, as amended. Reconsideration is respectfully requested.

Etievant discloses the use of electrical or corona discharges between electrodes, or microwaves for treating fuel gases. A membrane located at the periphery of the irradiation region allows the passive separation and removal of hydrogen exiting the irradiation region. There is no separation within the irradiation region as claimed.

Accordingly, Claims 1-3 and 9, as amended, are not anticipated by Etievant, since the reference does not teach or suggest “a separation arrangement for applying a force for separating the larger and smaller constituent components from each other within the irradiation chamber by forcing the larger and smaller constituent components toward different regions of the irradiation chamber due to differential motion characteristics of the larger and smaller constituent components,” as recited in Claim 1, as amended. In addition, for the same reasons above, Claims 6-8 are also not obvious in view of WO 02/26378 or Etievant. Therefore, Claims 1-9, as amended, are now in condition for allowance. Reconsideration is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By 

Darrell L. Wong

Registration No. 36,725

Telephone: (978) 341-0036

Facsimile: (978) 341-0136

Concord, MA 01742-9133

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